

## THE VASCULAR FLORA OF SEASHORE STATE PARK, VIRGINIA BEACH, VIRGINIA

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### ABSTRACT

Floristic studies of Seashore State Park, A National Landmark and region of floristic interest for more than a century, are reviewed. The present flora consists of 558 species in 306 genera in 107 families, including several Alleghenian species which reach their southern limit in the park. Changes in habitat have resulted in the loss of numerous species.

Key Words: vascular flora, Cape Henry, southeastern floristics, southeastern Virginia

### LOCATION

The 2770 acres (1121.85 hectares) of Seashore State Park occupy the greater part of Cape Henry forming the southern entrance to Chesapeake Bay. It is located in the city of Virginia Beach (formerly Princess Anne County), Virginia, at 36° 55'N and 76°00'W. The park's northwest boundary includes approximately .75 miles (1.21 kilometers) of beach fronting on Chesapeake Bay and abuts Fort Story Military Reservation (Figure 1). On the west and south are residential areas. The remaining park boundary, approximately 5 miles in length, is composed of Long Creek, Broad Bay, and Linkhorn Bay, tributaries of the Lynnhaven River.

### CLIMATE

The Cape Henry region is characterized by mild winters and long humid summers. Mean annual temperatures vary little, but average about 60°F (15.6°C) due to the modifying influence of the Atlantic Ocean and Chesapeake Bay. Daytime highs during the cold season are usually near 50°F (10°C) with nighttime lows about 30°F (-1°C). Temperatures range from over 100°F (38°C) to as

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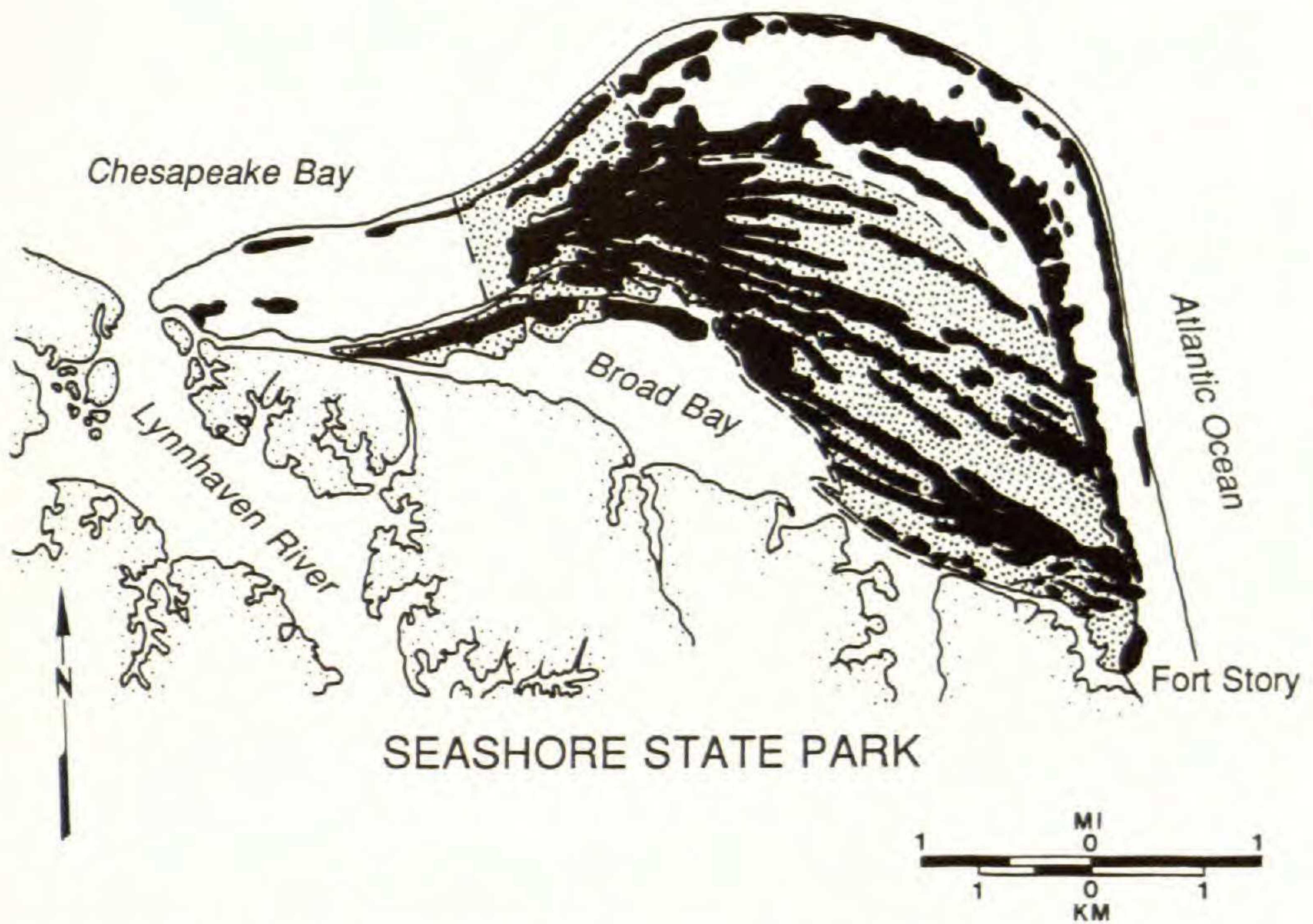


Figure 1. Map showing Cape Henry with major sand dunes (black), peaty swales (small stipples), zone of low coastal dunes (large stipples). Boundaries of the park are indicated by dashed lines.

low as  $5^{\circ}\text{F}$  ( $-15^{\circ}\text{C}$ ). The average growing season is 259 days. Annual precipitation averages 44.22 inches (112.3 cm) and is well distributed throughout the year with a maximum in August and minima in November and April. Summer rainfall is due mainly to showers and thunderstorms (Crockett, 1970). Significant precipitation occurs on an average of 120 days of the year. In winter, the average snowfall is 6.5 inches (16.5 cm). However, yearly snowfalls are extremely variable ranging from none up to 24 inches (57 cm). Snow seldom remains on the ground more than two or three days. South to southwest winds predominate with those from the north secondary. During the warm season, relative humidity averages near 90%. Hurricanes and other tropical disturbances occasionally affect Cape Henry and the surrounding areas. Considerable damage from wind and tidal flooding may result due to salt spray and salt water intrusion into usually fresh water habitats. Thunderstorms accompanied by severe lightning, high wind, and hail are frequent in summer and produce the greatest amount of storm damage (U.S. Department of Commerce, 1953).

## TOPOGRAPHY AND SOILS

The topography of Seashore State Park is characterized by a series of stabilized parallel dunes which traverse the arc formed by the cape's shoreline. The dunes—up to 75 feet (22 m) high—alternate with fresh water swales which lie near sea level (Figure 2). The soils of the cape, formed of wind-driven marine sediments of Holocene age, are of four main types: Newhan-Duckston-Corolla (white siliceous sand), Pamlico-Fripp-Lakehurst (gray sand), Pamlico (mucky peat), and Rhappahannock (mucky peat) (Hatch et al., 1985). The white siliceous sand has a high salt content and is found on the beach, foredunes, and in the shrub zone. Gray sand is found on the extremely large secondary dune (known locally as The Great Dune), as well as on the much lower relic dune lines behind. This sand is mainly siliceous, of a light gray color (due to a slight admixture of organic materials), seldom more than three to five centimeters in depth and underlain by the nearly pure sand and fine sediments extending to the basement rock. This sand is also found on the relic dunes behind the Great Dune. The pH ranges from neutral to very acid, and the drainage is from excessive to poor (Hatch et al., 1985). Due to the extreme geologic youth of Cape Henry (less than 5000 years in its present location according to Oyler, 1984, Master's thesis, Old Dominion Univ.), there has been little time for a true A soil horizon to form. The Great Dune descends at an angle of 45° directly into a swampy swale. These swales have formed in the old interdunal areas between the relic dunes. The soils of the swales, Pamlico mucky peat, are formed of partially decomposed organic matter over the sandy marine sediments. Such soils are deep but very poorly drained and usually have fresh, strongly acidic water. The thickness of the organic material ranges from 20 cm. to 100 cm. The organic material is extremely acid (Hatch et al., 1985). Rhappahannock mucky peat is found where erosion has caused salt water intrusions into formerly fresh swales and where new saltmarshes are forming along Broad Bay and Long Creek. These soils are also deep and very poorly drained; they are composed of marsh detritus and loamy marine sediments. This soil is strongly saline as it is flooded twice daily with brackish tidal water.

## BOTANICAL HISTORY

An overview of the history of Seashore State Park is provided by E. Johnson (pers. comm., 1986). The botanical history of Cape

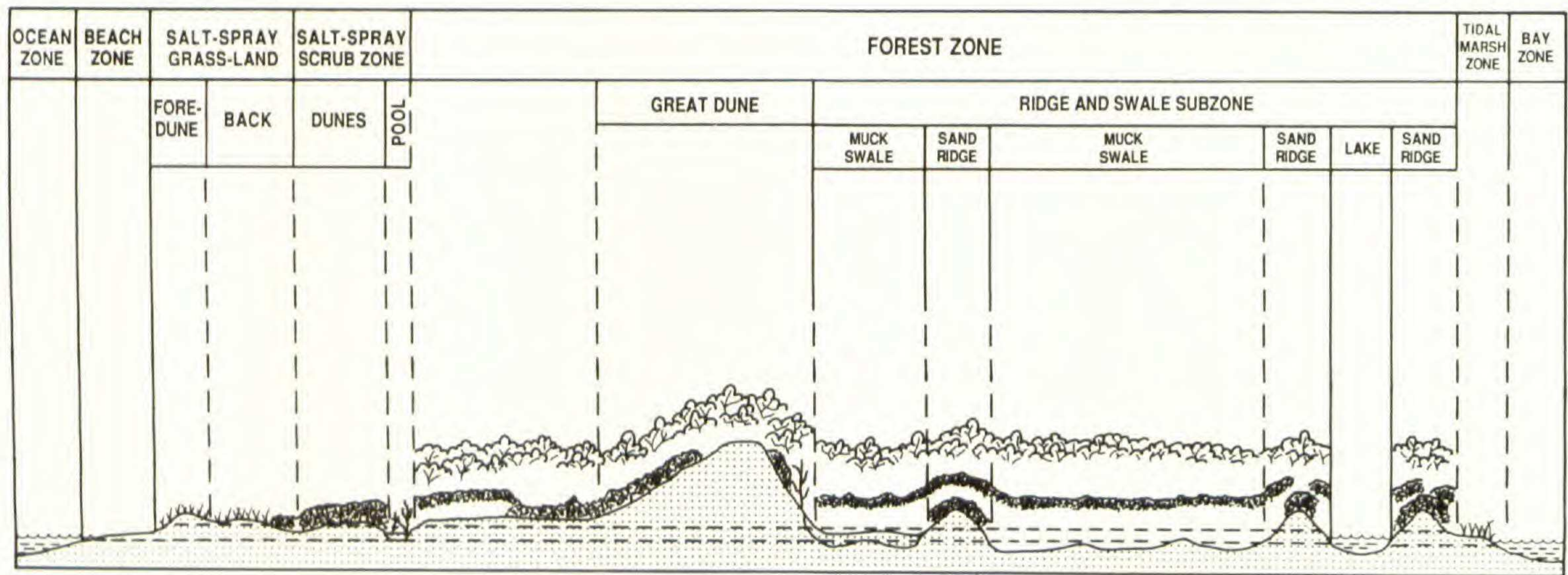


Figure 2. Diagrammatic cross section through Cape Henry, showing topography and zonation of vegetation (after Egler, 1942).

Henry includes some of the earliest descriptions of North American vegetation by Europeans since the Cape is where the settlers for the Jamestown expedition first landed. But the area was visited even earlier, in 1585, by Thomas Harriot and John White, members of Raleigh's Roanoke, Carolina Expedition (Quinn, 1985) and discussed in Harriot's "A brief and true report . . ." (1590). This report was followed seventeen years later by the reports of the Jamestown settlers' first sighting of the Virginia shore on April 26, 1607 (Old Style). John Smith (1624) related: "The land white hilly sands like unto the Downes, and upon the shores great plentie of Pines and Firres. . . ." This description is valid today. The "Firres" are *Taxodium distichum*. In 1770, the whole of Cape Henry was declared public lands at the request of prominent local landowners, an action which preserved the natural aspects of the cape for the next 100 years. However, in 1870, the Reconstruction government sold these lands to lumbering interests for one dollar per acre. Fortunately, due to the topography of the area, it could not be ditched and drained as was the Dismal Swamp, thus a large part of its forest was not destroyed. The last lumbering was done in 1927.

Drawn by reports of the unusual nature of the Great Dune, B. H. Latrobe, Capitol architect and natural philosopher, visited Cape Henry in December, 1798. He observed that the dune descends directly into the swampy "Desart" and noted that it "is overgrown with aquatic trees and shrubs; the gum, (*L. styraciflua*) the cypres (*cup. disticha*) [= *Taxodium distichum*], the maple (*acer rubrum*), the tree improperly called the sycamore (*platanus occidentalis*), the *magnolia glauca*, the wax myrtle (*myrica cerifera*) and the reed (*ar. tecta*) are the principal . . ." He also discussed the advance of the active dune into the area behind, still called The Desart (Latrobe, 1798). There are several photographs in Kearney (1901) which document Latrobe's descriptions. Latrobe went on to say that in the preceding sixteen years the dune had grown in height and had migrated a distance of about 350 yards into the swamp killing everything in its path and speculated, "If the hills advance at an equal ratio for 20 or 30 more years, they will swallow up the whole swamp, and render the coast a desert indeed, for not a blade of grass finds nutriment upon the sand." Fortunately, this process slowed and has nearly ceased or we would not have the extensive flora found in Seashore State Park today.

There have been several studies on the flora of Cape Henry, the most complete of which is part of T. H. Kearney's "Botanical Study of the Great Dismal Swamp Region" (Kearney, 1901). Kearney's work remains a classic and is useful today. Another student of the Cape Henry flora was the intrepid Merritt Lyndon Fernald. In his first trip to Cape Henry in 1933, Fernald was surprised by the "relative abundance there of Alleghanian types, growing in close proximity to the typical coastal plain species" (Fernald and Griscom, 1935). The problems associated with botanizing in southeastern Virginia were discussed by Fernald in *Rhodora* in 1939. He wrote, "Every natural spot has to be investigated: one cannot safely pass one of them if he wishes to find all the specialities." This observation is so true of the park as many of the species are confined to single areas and are unknown in nearby habitats. The same article enumerated flora that Fernald considered native to Tidewater, Virginia. This list included over fifty species contained in our Catalog of Species (Wright, et al., 1990). On another of his trips to Virginia Beach in the summer of 1939, Fernald mentioned being taken to the station for *Osmanthus americanus* (Fernald, 1940). The only known station for this species in Virginia (Harvill et al., 1986) is within the confines of the park. Other interesting plants noted by Fernald (1935) included the orchid *Habenaria cristata*, now apparently extirpated. Fernald also noted in his Midsummer Vascular Flora of Virginia (1935) that "... one of Tidestrom's original collections of his *Typha angustifolia* var. *virginica* was from Cape Henry."

Because of travel restrictions during World War II, Fernald made few additional trips to this southeastern corner of Virginia, also the southeastern limit of his manual's range, but continued to publish his work based on material previously collected. His last specific publication citing flora from Cape Henry appeared in his Additions and Subtractions from the Flora of Virginia (Fernald, 1947).

A contemporary and protagonist of Fernald was Frank E. Egler (1942), who published the first work devoted exclusively to the flora of Seashore State Park. In response, later in 1942, Fernald published a diatribe against Egler in one of the longer footnotes published in *Rhodora*. This attack was rebutted by Egler in *Rhodora* in 1943. During a visit to Dr. Egler's home in the summer of 1981, he told one of us (JBW) that he never visited the park again, fearing its natural aspect would be greatly changed.

## METHOD OF INVESTIGATION

Initial field work of this investigation was conducted between September 1980 and the end of August 1982. An attempt was made to cover every section of the park at least twice during each season and to visit representative sites at least once a month. All of the marked trails were covered, as well as transects across the dune lines and, where possible, through the swales. The beach proper and foredunes, as well as the camping area which is in the shrub zone, were thoroughly covered. Attention was also given to the disturbed areas. Special efforts were made when there was radical change in the water level due to droughts or periods of excessive rainfall. One set of specimens is deposited at ODU; the other will be deposited at the park. We did not follow the advice Fernald gave Egler to examine all the relevant specimens in the Gray Herbarium (Fernald, 1942).

On one of his many collecting trips to this part of Virginia, Fernald in 1947 wrote:

“Thus we have again demonstrated that, in spite of almost complete clearing, settling, and cultivating of many areas of Southeastern Virginia, there is plenty yet to do for the botanist who knows what to avoid as ordinary, what to collect as unusual. Almost every wholly and unmolested spot has its isolated specialties. The great problem is to locate these spots. . . . Only by learning the more conspicuous “indicators” and promptly following up their indications (before the plow or bulldozer gets there) can we find the last remnants of what originally must have been the most varied and numerically the largest indigenous flora in the Manual area. Many species found by early botanists are apparently gone but many others, not seen by them, still linger. These we want to know about before Man has destroyed them.”

How much more true Fernald's statement is today, now that Virginia Beach is one of the fastest-growing cities in the nation with a population in excess of 350,000, than it was 40 years ago when Princess Anne County was a mostly agricultural county with a total population of less than 40,000 residents. In the wake of this explosive growth, it is imperative that the flora not only be documented, but that natural areas such as this park be preserved in their entirety as living museums of Virginia's botanical heritage.

## VEGETATIVE ZONES

Egler (1942) divided Seashore State Park into seven zones more or less parallel to the shoreline. These zones were generally distinct from one another due to environmental factors and the dominance of certain species. Only the boundaries of several of the zones have changed due to physical factors such as growth of a new and higher foredune and removal of the tidal gate protecting White Hill Lake. Dune building, installation of the tidal gate and construction of most of the trails were done in the 1930's. Egler's analysis is still useful, therefore, only significant changes will be discussed here.

1. Ocean Zone. Like the rest of the cape, this zone is characterized by a sandy substratum. This zone was not included either in Egler's "Checklist" or in this study, as it is unvegetated.

2. Beach Zone. This area is a gently sloping, accreting beach, generally rising no more than five feet above sea level. Like typical barrier beaches, it is divided into three parts: surf zone, intertidal zone and upper beach, the first two of which are unvegetated. The upper beach extends to the foot of the foredune. This zone is the first that has undergone considerable change since Egler's visit. In fact, the present foredune did not exist in 1940; it is the result of dune growth instituted by the federal dune building project from 1936 through 1938. This new and still-growing dune now averages in height more than 15 feet above sea level (USGS, 1979). The plant community is much the same as in Egler's time with the exception of *Carex kobomugi* Ohwi which is rapidly becoming the dominant ground cover. Its existence here was one of the chief points of Fernald's attack on Egler (Fernald, 1942). Fernald did include it, however, in *Gray's Manual of Botany* in the 1950 edition (Fernald, 1950). Until 1980, *C. kobomugi* was only found in small patches in the lee of the foredune. The coal mine strike of that year resulted in over 100 colliers being anchored for months in Lynnhaven Roads, only several hundred yards off the park's beach. Although illegal, many of these ships pumped their effluent overboard at night only to have it be washed ashore by the tides. Many northeasters that winter seem to have thrown this "fertilizer" high on the foredune giving *C. kobomugi* the nutrients it needed to spread rapidly. Now, more than 10 acres on both sides of the foredune are almost covered with it. There is practically no dune erosion in these areas, seeming to



make this species ideal for dune protection. It is, however, unpopular with many local conservationists because it tends to crowd out native, more "desirable" grasses such as *Uniola paniculata*.

3. Salt-spray Grassland Zone. This next area extends from the crest of the foredune to the beginning of the Shrub Zone as described by Egler.

4. Salt-spray Shrub Zone. This zone follows but is much reduced in width, probably due to the protection offered by height of the present foredune. This protection from the wind and salt-spray has allowed the seaward advance of trees of the maritime forest. This zone has also extended several hundred yards farther inland, nearly to the foot of the Great Dune.

5. Forest Zone. Egler's "pool" subzone of his Scrub zone has now become part of the Forest Zone. The canopy here now consists of mature though somewhat stunted *Quercus virginiana* (which are suffering heavy damage from the chestnut blight fungus, *Cryphonectria parasitica*; Stipes et al., 1978), *Q. incana*, *Q. laurifolia* as well as several oak hybrids; mature *Pinus taeda* predominate. Still present are *Salix nigra* and *S. carolina* as well as the freshwater community noted by Egler (1942). This small freshwater swale is an excellent example of how the large swales behind the Great Dune were originally formed. The Great Dune Sub-zone has also undergone significant changes probably due also to growth of the foredune and the advancing front of the maritime forest now protecting it from direct assault by ocean winds. For centuries the dune apparently remained bare except for a few pioneer grasses as described by Latrobe (1798), Kearney (1901) and Egler (1942). Since the 1940's, the dune, with the exception of a few minor blowouts, has gradually become heavily forested with the typical Pine-Oak-Hickory community described by Egler and Kearney (op. cit.).

The nature of White Hill Lake has also changed dramatically. The freshwater lake and marsh described by Egler no longer exist in spite of information to the contrary supplied by the park. The area originally had been one of the typical fresh water interdunal swales but with a small fresh stream, the original headwaters of Long Creek, running through it. At some point, perhaps in Colonial times, beavers apparently dammed the stream, making a large pond eventually containing many large bald cypress (*Taxodium distichum*). When the Civilian Conservation Corps was developing the park's trails in the 1930's, this dam was turned

into a causeway and an automatic tide gate was installed across the stream. In the interim, rising sea level and a blowout in the dune line were causing Long Creek to become brackish. This tide gate effectively preserved the fresh water lake described by Egler. By 1975, the condition of the gate had deteriorated to the point that park personnel removed it, allowing brackish water to invade the lake and its marsh. The ancient stately *Taxodium* are now dead snags and the younger trees at the edge of the marsh are rapidly dying due to the brackish water while the marsh itself is becoming a typical salt marsh. Another large, freshwater marsh was breached during the Spring 1963 storm and is also in a state of transition. The original nature of Long Creek was documented by one of the original Jamestown settlers in a description of the first landing and exploration “. . . wee landed and discoured a little way, but wee could find nothing worth speaking of, but faire meddowes and goodly tall Trees, with such Fresh-waters running through the woods, as I was almost rauished at the first sight thereof . . .” (Percy, 1610). The upper reaches of this now intermittent stream is the home of the only reported natural stand of Atlantic White Cedar (*Chamaecyparis thyoides*) remaining in the city of Virginia Beach (old Princess Anne County).

These fresh water marshes were undoubtedly the habitat of several species noted by earlier workers including *Pontederia cordata* L., *Spiranthes* spp., *Nuphar luteum* (L.) Sibthorp & Smith, *Callitriche heterophylla* Pursh, *Juncus repens* Michx., *Rotala ramosior* (L.) Koehen, *Proserpinaca pectinata* (L.) Herbert, *Zephyranthes atamasco*, etc., which we have not found in the park and assume an extirpated.

6. Tidal Marsh Zone. Although somewhat larger, this area is the same as in Egler's time as is his Zone 7, The Bay Zone. In general, Egler's treatment of the roads and trail-sides are still adequate.

#### FLORA

Seashore State Park is dominated by species belonging to the flora of the southeastern United States. Kearney (1901) considered Cape Henry to be part of the Great Dismal Swamp Region as well as the northeastern limit of the the Austroriparian area. There is little reason to disagree with his analysis today. There are, however, a number of northern species reaching or nearing

their southern limit, as well as a number of Alleghenian species (Fernald and Griscom, 1935). One set of our specimens is deposited in ODU, the other is to be kept at the park. To date, 558 species belonging to 106 families and 306 genera have been collected. These plants are listed in the Catalog of Species (Wright, et al., 1990).<sup>2</sup> Of these, 30 are on Virginia's Natural Heritage Program list of rare and endangered species. Only species found by the present authors are included in the Catalog. An additional 75 species listed for Cape Henry by other botanists such as Fernald, Kearney, Egler and others, are listed separately. The families are listed in the sequence found in the *Manual of the Vascular Flora of the Carolinas* (Radford et al., 1968). The genera and species are then listed alphabetically. The nomenclature is also that of Radford (except for genera or species not found therein) which follow *Gray's Manual of Botany* (Fernald, 1950), or Gleason and Cronquist (1963).

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#### LITERATURE CITED

- CROCKETT, C. W. 1970. Narrative climatological summary, Cape Henry, Va. Climatography of the United States No. 20-44. U.S. Dept. Commerce, Washington, DC.

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<sup>2</sup> The catalog (species list) is available from the authors; a copy is also on deposit in the library of the Missouri Botanical Garden, St. Louis.

- EGLER, F. E. 1942. Checklist of the ferns and flowering plants of the Seashore State Park, Cape Henry, Virginia. New York State College of Forestry, Syracuse, NY.
- . 1943. The Seashore State Park, a part of Cape Henry, Virginia. *Rhodora* 45: 105–106.
- FERNALD, M. L. 1935. Midsummer vascular flora of Virginia. *Rhodora* 37: 378–413, 423–455.
- . 1939. Last survivors of the flora of Tidewater, Virginia. *Rhodora* 41: 465–504, 529–559, 564–574.
- . 1940. A century of additions to the flora of Virginia. *Rhodora* 42: 355–416, 419–521.
- . 1942. The seventh century of additions to the flora of Virginia. *Rhodora* 44: 341–354, 400–477.
- . 1947. Additions to and subtractions from the flora of Virginia. *Rhodora* 49: 85–115, 121–142, 145–159, 175–193.
- . 1950. *Gray's Manual of Botany*, 8th ed. American Book Company, New York, NY.
- AND L. GRISCOM. 1935. Three days of botanizing in southeastern Virginia. *Rhodora* 37: 128–157, 167–189.
- GLEASON, H. A. AND A. CRONQUIST. 1963. *Manual of Vascular Plants of Northeastern United States and Adjacent Canada*. Willard Grant Press, Boston, MA.
- HARRIOT, T. 1590. *A Brief and True Report of the New Found Land of Virginia*. London. Reprinted 1969. Johnson Publishing Company, New York.
- HARVILL, A. M. JR., T. R. BRADLEY, C. E. STEVENS, T. F. WIEBOLDT, D. M. E. WARE AND D. W. OGLE. 1986. *Atlas of the Virginia flora*, 2nd ed. Virginia Botanical Associates, Farmville, VA.
- HATCH, D. R., J. E. BELSHAN, S. M. LANTZ, G. R. SWECKER AND D. E. STARNER. 1985. *Soil survey of city of Virginia Beach, Virginia*. U.S. Dept. of Agriculture, Washington, DC.
- KEARNEY, T. H. 1901. Report on a botanical survey of the Dismal Swamp region. *Contributions U.S. Nat. Herbarium*, vol. V. U. S. Govt. Printing Office, Washington, DC.
- LATROBE, B. H. 1798. Memoir on the sand-hills of Cape Henry in Virginia, Vol. 4, pp. 129–146. *In: Transactions of the American Philosophical Soc.*, Philadelphia.
- PERCY, G. 1610. Observations gathered out of a discourse of the plantations of the southerne colonie in Virginia by the English, 1908, pp. 129–146. *In: Philip L. Barbour, Ed., The Jamestown Voyages Under the First Charter 1606–1609, Vol. I*. Published for the Haklyut Society. Cambridge University Press, Cambridge, 1969.
- QUINN, D. B. 1985. *Set Fair for Roanoke, Voyages and Colonies, 1584–1606. For America's Four Hundredth Anniversary Committee*. University of North Carolina Press, Chapel Hill and London.
- RADFORD, A. E., H. A. AHLES AND C. R. BELL. 1968. *Manual of the Flora of the Carolinas*. University of North Carolina Press, Chapel Hill.
- SMITH, J. 1624. *The General Historie of Virginia, New-England, and the Summer Isles: with the Names of the Adventurers, Planters, and Governours from Their First Beginning. An':1584 to This Present 1624*. Reprinted Johnson Publishing Company, Murfreesboro, NC.

- STIPES, R. J., D. N. APPEL AND M. K. ROANE. 1978. Endothia species as pathogens of chestnut and oak. pp. 42-49. *In*: Proceedings of the American Chestnut Symposium, West Virginia University, Morgantown, WV.
- U.S. DEPARTMENT OF COMMERCE. 1953. Local climatological data with comparative data 1952, Cape Henry, Virginia. Chattanooga, TN.
- U.S. DEPARTMENT OF THE INTERIOR, GEOLOGICAL SURVEY. 1979. Cape Henry Quadrangle, Virginia, Virginia Beach City, 7.5 Minute Series. Reston, VA.
- WRIGHT, J. B., J. L. KERNELL, G. F. LEVY AND L. J. MUSSELMAN. 1990. Catalog of Species of Seashore State Park, Virginia Beach, Virginia. Jeffersonia: Newsletter of Virginia Botany (in press).

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